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Article Summary: As the population of Nebraska moved away from the river valleys, the availability of water and the methods of obtaining a ready supply continued to evolve. This article discusses water witches, well digging by hand and by auger, drive wells, hydraulic wells as well as the use of pumps, windmills and irrigation in the Nebraska frontier.

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Photographs / Images: A well near a house; James McCrea and pulley type well; Dutch Joe Grewe, well digger; horse-powered well drilling rig; Halladay Standard Windmill

W A T E R

A FRONTIER PROBLEM

By EVERETT DICK

THE gradual decrease in average yearly rainfall from east to west in Nebraska was reflected in the difficulty of securing water for domestic use. The first settlers naturally sought water very much as they had farther east. Since early settlement was in river valleys where there was a supply of wood, water was usually readily accessible also. Fortunate indeed was the individual who could find a spring near which to make his log cabin or dugout.

But even a man this fortunate usually had to carry water to the house, since a suitable building site ordinarily was some distance away. The newcomer dug out the spring, lined it with stones if these were available and if not, fenced the outlet so stock could not enter the basin, but were compelled to drink from the overflow at a point below the water source. Neighbors who had no such good fortune came for miles around to dip water and haul it to their homes. In time the

Dr. Dick is Research Professor of American History at Union College in Lincoln. His study resulted from a Woods Fellowship from the Woods Charitable Fund, Inc., administered by the Nebraska State Historical Society.

owner built a fair-sized box with a lid on it where milk and butter could be kept. With prosperity, a small structure known as the spring house might be built for this purpose over the precious basin. Unfortunately, most of these springs ran dry during the latter part of summer.

The great majority who were not so fortunate as to find a spring at first dipped directly from some little prairie creek. Toward the end of summer, especially during dry seasons, creeks tended to dry up, but long after the stream ceased to flow, little stagnant pools remained in the holes washed out during flood periods. Many settlers pushed back the green scum from the surface of these longest lasting pools, dipped the water, and hauled it to the house for drinking and household purposes.¹

For the few who had roofs of either shingles or board and tar paper, the rain barrel was apt to be an institution. A trough was made by nailing the edges of two one-by-four boards together to form a V. One end was fastened to the eave of the house toward one corner and the other end allowed to rest on the edge of an old kerosene barrel located at the other corner. Considerable mud collected in the barrel from the sod covering of the roof, but it settled leaving the liquid clear. Precious rainwater was collected in this manner to be doled out for purposes which required soft water. An unfortunate aspect of the rain barrel was that mosquitoes laid their eggs in the stagnant water, and the larvae, known as wiggle tails, infested the fluid. Some who did not have enough lumber to make a trough simply tied a board under the eave and allowed it to drain a portion of the water into the rain barrel. The rain barrel was an institution in another way also. Children loved to climb up and yell down a half-filled rain barrel, which echoed to their childish prattle. Not content merely with yelling, they often threw things into the water, and when something was missing, a search of the rain barrel sometimes brought forth the lost article.

An improvement over dipping water from a stream which froze in winter and dried up in summer was the dug well such

1. Cass G. Barns, *The Sod House* (Madison, Nebr., 1930), 228-235.

as overland migrants to Oregon, Utah, or California had dug on the bank of the Platte River. By digging down to the water level of the Platte, one could find an ample supply of water. Road ranch settlers and others who came early and located along the Platte had to dig down only ten to twenty feet to find water. In some instances, water was secured by digging such a few feet that a hole the size of a barrel was dug and two or three kerosene barrels with the ends knocked out were lowered and set end on end for a curb.²

The rectangular surveying system used by the United States government, and the settlers' response to it, in a large measure dictated well locations in Nebraska. The country was cut up into plots a mile square known as sections. Almost invariably the roads in the country were laid out along the outer edges of these section boundaries. The traveler knew almost without fail that in the eastern and central part of the state he would strike a cross-road every mile. Before fencing came in, settlers paid little attention to section lines but struck out across the country to the land office, county seat, or trading center, forming trails across the prairie at will. Even after barbed wire fencing came, it was customary in winter to lower the wires and drive across pastures in the same manner. Nevertheless, when the settler decided on his permanent home, he thought in terms of locating the house on the section line road—not too close to the road, for that might invite undesirable company, but in general fairly close, as the great majority of houses in Nebraska outside of the ranching area are today. Obviously, the settler dug his well as near to the house as possible for the sake of convenience.

Here was where the water witch (wizard) came into his own. It seems the term "water witch" was used indiscriminately for either a male or female. Some believed in him; others did not, but he was used more or less in the state to locate a vein of water before making a well. Often the householder would indicate where he wished his well to be and ask the witch to determine whether water could be

2. Frances I. Sims Fulton, *To and Through Nebraska* (Lincoln: Journal Company, 1884), 35.

found at that point. If his divination indicated a vein at the desirable point, a well was dug, but if not, he tried other desirable building sites along the roadway. The water witch was often a neighbor who divined for people in a given vicinity on a non-professional basis, although some witches made a business of it and charged a regular fee for their services. The equipment of the witch was a Y-shaped forked object. In areas where fruit trees grew, a peach or plum branch was used, but since these were not usually available, the water witch frequently used an osage orange or a willow fork. In fact it did not seem to make much difference of which material the fork was made.

In March, 1958, the *Nebraska Farmer* opened its columns to the water witches and their detractors; they had a field day. Water witches from Nebraska and other states who used the same formula informed the readers how the work was done. A Grand Island man said he used a green Chinese elm fork. Some used metal forks. One used a quarter-inch welding rod. Otto F. Lorenz of O'Neill used a No. 9 copper wire for witching. Mrs. Leonard Langhorst of Dodge asserted that her father could witch better when he was barefoot and that he could not only locate an underground stream, but could tell how deep the driller would have to go to find it. He did this by holding the stick slackly; the loose end would bounce up once for each foot in depth at which water would be found. One man stated that in forty-seven years of water witching he had over a .500 batting average. He said that many times he had found an underground stream and followed it for miles only to end up at a flowing spring.³ S. Placek, a well driller from Lynch, reported that in fourteen years' experience as a well digger he felt assured that water witching worked. He cited one instance in which he tested out the validity of water witching. He had one wizard locate a vein and drive a stake at the recommended well site. Placek then changed the stake and engaged another man of the same craft to locate a vein. The second man paid no attention to the changed stake but returned and marked the original spot. The

3. *Nebraska Farmer*, C. No. 6 (March 15, 1958), 40.

driller once more moved the marking and engaged a third water locator to find water. He too set the stake where it had been placed by the other two men. Said Mr. Placek, “. . . I just believed what I had seen. I can't witch for water myself. The only time I can tell where there is a lot of water is when it is running in my shoes.”⁴

The *Lincoln Weekly Call* published an account of the manner in which a water witch worked farther east, and we can assume that Nebraska water locaters worked in the same manner. The witch took the two branches of the Y-shaped rod in his hands and held the longer end or bottom of the Y out in front of him horizontally as he slowly walked along. The observer said he seemed to lose himself as if he were lifted out of the common sphere into relation with something more than human. With his face set and with no apparent thought of his surroundings other than intently watching the fork, he walked back and forth as though he was letting the fork lead him instead of his propelling it. Eventually the free end of the fork dropped from the horizontal to a given point on the ground as though pulled down by some magnetic power. He then drove a stake and his work was done, unless he was among those who sought to tell how far it was to the water.⁵

After the settler had determined the location of his well, either by use of a water witch or by a blind guess, he started to dig. In the area not too far from the lower Platte where water was to be found at a depth of from fifteen to twenty feet, two neighbors often helped one another. The landowner started the open well by digging in a circle about three feet in diameter with a spade. He continued with pick and shovel until he could no longer throw the dirt out of the top; then he secured the services of his helper. A log post with a fork at the top was set on each side of the hole. A straight log was laid across the forks, and a handle attached to one end. A rope was then fastened to the log roller. By turning the crank, the operator wound the rope around the roller. The

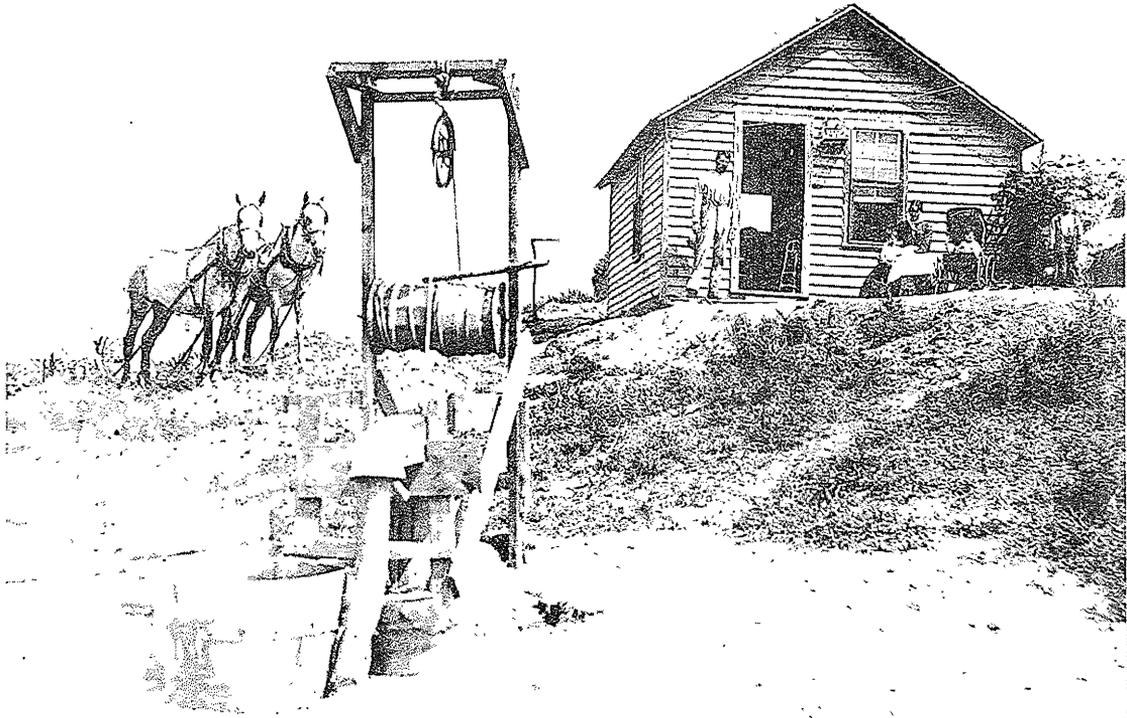
4. *Ibid.*, C, No. 5 (March 1, 1958), 42; a happy incident to a well digger.

5. *Lincoln Weekly Call*, February 7, 1890.

loose end of the rope was fastened to an iron-bound bucket, often a half barrel. By slowly turning the handle, the operator could play out the rope and lower the bucket into the well where the digger filled it and gave the signal to hoist. By vigorous use of the handle of the windlass, the bucket was raised, then emptied a little distance from the top. A ratchet to hold the roller in place and crude bearings were refinements added as time went on.

The digging proceeded until the sand or gravel stratum which contained the underground flow was reached. A board box was set in the bottom as a sort of floor and a wooden platform with a square hole in the center was built over the top of the well. A box perhaps four feet high was built on this platform around the hole. On two sides of the box were upright pieces about six feet high, topped with a cross member nailed between them. A twelve-inch iron pulley was then fastened to the under side of the transverse piece and a three-quarter inch chain was run through it. Each end of the chain was attached to an iron-hooped, heavy oak bucket of about ten-quart capacity. The buckets balanced one another; as an empty one was let down, its weight helped to raise the full one, which passed it as it was drawn up. As the level of the water raised or lowered in the well with the seasons, links of the chain were taken off or added. The buckets were heavy enough when lowered rapidly to sink into the water with a gurgling sound and a tug on the chain. Then hand over hand the full bucket was drawn past the descending one to the top. Over the top of the box-like curb, around the boxed mouth of the well, was a lid of two leaves with notches on their edges to accommodate the two chains. When water was not being drawn, the buckets hung in the well, and this lid was fastened to keep out foreign matter.

But the bucket wasn't the only thing which hung in the well. The well was also the refrigerator of the day. Cream was hung there to cool it sufficiently to churn well; after churning, the butter was hung there until enough accumulated to take to market; milk was hung there to keep sweet from one meal to another; sometimes leftover victuals were placed in containers, arranged in a bucket, and



A well next to the house was sometimes regarded as a luxury. Often water had to be hauled from a distance.

suspended. A watermelon was sometimes placed in a gunny sack and suspended by a rope near the water to cool until time to eat it.

Although shallow wells usually brought little peril, as settlement moved westward and out onto the table lands where the water level was far underground, well digging was accompanied by certain hazards. When a stratum of stone was reached, it was necessary to blast through it. A charge had to be set off with a crude fuse since an electrical detonator had not even been thought of at that time. Sometimes the undependable fuse ignited the powder before the digger was out of the well, or perhaps he got out and waited in vain for

the explosion. Becoming impatient, he might go into the well and bend over the charge to see what had gone amiss. In such a case, a delayed explosion might occur, crippling the workman.

Another hazard in well digging was from heavier-than-atmosphere gas which sometimes gathered in the bottom of the excavation and overcame the digger. This was called "damp" and was variously known as black damp, fire damp, or choke damp. How it could be differentiated I cannot say, but it apparently was carbon monoxide, a gas which is heavier than air and would accumulate in the bottom of the well like a pool of water. It was more dangerous than water, however, for when one goes under water, he recognizes he is in a medium which shuts off his breath. When one breathes carbon monoxide, it is taken into the lungs, starves the body of oxygen, and a victim never knows he is in danger until it is too late. The digger often went into the well and never made a sound to indicate that he was in difficulty. By the time someone at the top of the well discovered that something was wrong, it was too late to rescue the unfortunate one. Since the presence of damp was comparatively rare, rescuers often did not realize the situation and, going down into the well, were overcome themselves without effecting a rescue.

Later, with the use of pumps to lift water out of the well, there was always the problem of keeping the cylinder in order, and the deeper the well, the more difficult the job. The cylinder had to be within thirty-two feet of the water or it would not draw water to the surface. In practice, it was often far below the surface of the water. The cylinder had a piston with a valve in it, and if this mechanism failed, a crew with a derrick had to raise the pump and cylinder high enough to put in a new valve or piston. In shallower wells, it was the practice for a man to descend and make repairs without hoisting the pipe and pump. These old wells were sometimes partially filled with damp. A wise precaution was to lower a lighted lantern into the well. If the flame ceased to burn, it indicated the presence of damp. A small flame would

not ignite the gas. Intense heat would ignite it, however, and this presented a way of clearing out the well so men could work in it. A large bundle of dry, combustible hay was set on fire and lowered into the well on a wire. If the fire produced sufficient heat, the gas ignited and burned out the well. Another method was to dip out the invisible gas and pour it on the ground like water.

In the second week in August, 1874, John Livingston, who lived two miles south of Plattsmouth, had occasion to repair the pump in his well, which was about twenty-five feet deep. An unnamed Swede who had been working about the community doing odd jobs offered to go down and effect the repairs. The Swede descended the rope and Livingston heard nothing more from him. Livingston called and getting no response feared that bad air might be the cause of his silence. Securing help, he had men lower him to aid his hired man. Taking a lighted candle in hand, he held it down before him and ordered the men to lower away. When he was about eight feet down, his candle was extinguished and he shouted for them to draw up quickly. They did as ordered, but just as they had him almost within reach of the top, he dropped and fell to the bottom. More help was procured, and by means of ropes and drags both men were speedily taken from the well. Livingston apparently died from the wounds received by the fall, but the Swede, who was scarcely bruised, died from fire damp, according to the report.⁶

On September 17, 1880, near Waverly, a young man named Richard Hornby, who was working for a neighbor, William Garland, went down into a well and was suffocated by the gas. Another young man who went down to assist him was pulled out of the well insensible, but recovered.⁷ A few experiences of this kind reported in the newspapers evidently caused more caution or else the presence of damp was relatively rare, for reports of this kind occurred only occasionally in eastern Nebraska.

6. *Nebraska Herald* (Plattsmouth), August 13, 1874.

7. *Daily State Journal* (Lincoln), September 18, 1880.

Near the streams, where water was to be found at a reasonable depth, other methods were used in a limited way in some places to secure water. One was the use of an auger similar to one used in boring post holes for a fence. The auger was placed on the lower end of a pipe about three quarters of an inch in diameter and four feet high. On the top of the pipe was a perpendicular handle about two feet long made of hardwood. It was rounded off nicely to form handholds. When the auger was set on the ground and the operator turned it to the right, the auger would eat into the soft earth. When the container above the cutting edge of the auger was full of earth, the operator lifted it out of the hole and set it on the ground; there the earth was cleaned out and it was lowered into the hole once more to gather in another gallon or so of earth. When the hole had been dug down about four feet, the handle was taken off and another four feet of pipe was screwed onto the original length. Thus, as the earth gave way before the auger, new lengths of pipe were attached until a depth of twenty-five or thirty feet was reached and, hopefully, a vein of water. The well was then cased by driving down lengths of pipe slightly smaller than the hole, and the well, similar to a drilled well, was ready for use. The search for water in this manner had serious limitations, however, for the auger could not penetrate in any area where strata of shale or other unmanageable layers of material lay, and the water-seeker had to resort to drilling.

Another type of well which could be made under conditions similiar to those for the auger well was the "drive well." Immediately after the Civil War, patents were granted to three men for drive wells: Byron Mudge, Nelson W. Green, and a Mr. Suggett who lived in the East. The first drive well was put down by Byron Mudge for Green and consisted of a one and one half inch pipe painted with zinc which had a point covered with a wire strainer. It was driven into the ground a length at a time with a sledge hammer until the point entered the water sand. A small pump was then attached to the top of the pipe. A block of wood was used to cover the top of the pipe while driving it, and comparatively short lengths of pipe were added as needed. The success of

these wells depended upon a vacuum, formed by the pump and the tight connection between the pipe and the earth around it, which eliminated atmospheric pressure.⁸ According to the *Scientific American*, some farmers installed a number of these wells about their premises—in their kitchens, cellars, and the fields, much as the modern farmer has faucets on a central pressure system today.⁹

The originators of this system sought to make a profit from their invention. They arranged with Cowling and Company, a pump manufacturing establishment of Seneca Falls, New York, to produce the device and let contracts with dealers and agents for the sole rights to sell the product, charging a ten dollar royalty to the agent for each drive well put down. Since the equipment was simple, it could be made locally, and it was difficult for the patentees and their agents to prevent infringement. As a result, the patentees brought suit and the courts upheld the inventors. The agents then went among the farmers who had driven these wells and sought to collect the ten dollar royalty for each well. If they refused to pay, the agents threatened to sue to collect the commission.¹⁰

The farm papers urged the farmers to fight the monopoly, and the Grange took up the altercation in behalf of the farmers. Just how many of these drive wells there were in Nebraska it would be impossible to say, but there were enough for the *Nebraska Farmer* to take a firm stand against this "drive well swindle," as it was commonly called by the farmers:

Hired agents of the Drive-Well monopoly are again turned loose upon the farmers and others who are so unfortunate as to have one of those contrivances upon their premises as will be seen by the following note which we clipped from the *Fremont Herald*.

8. Earl W. Hayter, "The Western Farmers and the Drivewell Patent Controversy," *Agricultural History*, XVI (January, 1942), 18-19.

9. *Scientific American*, XLVIII, No. 21 (May 26, 1883), 320.

10. Hayter, "The Western Farmers and the Drivewell Patent Controversy," 23-27.

"To whom it may concern:

Time having expired to allow discount on royalties for driven wells (pumps), all infringers must pay the full amount of ten dollars after December 10, 1879, in this county for a license on each and every well of such construction in use. Ample notice having been given, all who neglect to pay will be liable, without notice, to suit for damages and injunctions, restraining them from use of such wells. . . ."

But the citizens of that propinquity do not propose to submit to the will of the so-called "patentees" of the drive-well, and at once called a meeting at Fremont . . . a committee was appointed to collect fifty cents from each person using one of these wells, with a view to meeting all necessary expenses incurred in fighting the matter to a successful end . . . Organize yourselves for action—as the Dodge County people have—and turn a bold front upon the enemy. Millions for war, but not one cent for tribute.¹¹

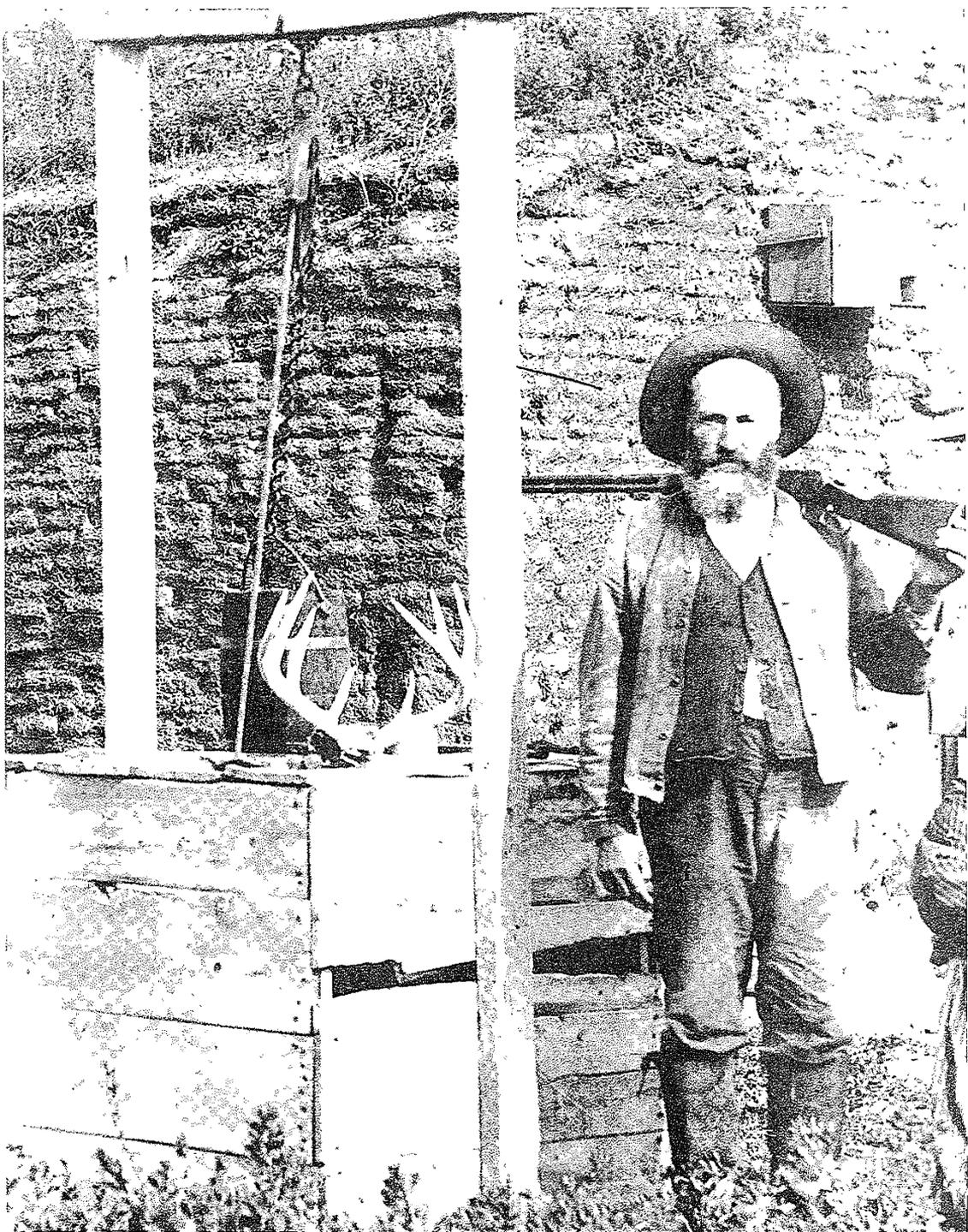
Finally in 1887 the United States Supreme Court reversed a former decision in favor of the farmers.¹²

As settlement moved out upon the high plains where auger and drive wells were not feasible, it was customary to dig deep wells by hand. Here another danger appeared—cave-ins. In shallow wells often no curbing was constructed except around the few feet just below the surface where heavy rains softened the ground and caused the earth to slough off during a wet season. Experience showed, however, that in many places a curb was needed both to protect the digger while making the well and to keep it useable afterward. This was particularly so on the table lands where wells were dug down as deep as one hundred feet or more. Since Nebraska has so little stone, it was necessary to use boards for this purpose. Much of the lumber shipped into Custer County in the 1880's was used for well curbing. The best kind was hardwood such as oak or other so-called "native lumber" rather than less enduring boards from the northern pineries.

Well digging on the table lands became a profession requiring real skill. Men had to learn by experience, often at

11. *Nebraska Farmer*, IV, No. 1 (January, 1880), 3.

12. Hayter, "The Western Farmers and the Drivewell Patent Controversy,"



James McCrea stands next to his pulley type well. One of the two buckets is visible. Note the lack of a windlass, buckets came up hand over hand.

great peril to their lives, which of the various strata through which they dug required curbing. Sometimes they curbed only a stratum of sand or gravel and left the rest of the well uncurbed. This involved hanging the curb on pegs driven into the walls of the well. However, most wells were probably curbed throughout. Curbing had to be made at the top of the well and lowered as the well was dug; since the boards had to be nailed to the earth side of the corner posts, this could not be done inside the well. When diggers used wooden curbing, the well was usually made square in shape in order to accommodate the curb. Charley O'Kieffe described the process:

You started with a goodly supply of two-by-fours for the corner supports and plenty of board lumber for the side walls. A two-by-four was put up on each of the four corners of the well opening, which was usually three feet square. As the dirt was dug out and disposed of, the posts slowly traveled down and side boards were set between them.¹³

Well diggers on the high plains led perilous lives akin to those of soldiers on the battlefield. In one incident, Nels Christensen, a veteran well digger in the tablelands between Niobrara and Lodgepole, was at the bottom of a well two hundred and eighty feet down when the rope which had pulled a half barrel of dirt almost to the top of the well broke. As the bucket plunged toward him, Christensen threw himself as flat as possible against the side of the well. The bucket shaved the skin from his nose, tore the clothing from his chest, and landed with a tremendous thud at his feet. The helper at the top, certain that his partner was dead, left the windlass and ran to get a neighbor to help lift the corpse out of the well. When he returned, he was astounded to hear loud exclamations from the depths of the earth objecting to his having been deserted at such a time.¹⁴ In 1918 Christensen gave his pick and shovel to the Nebraska State Historical Society. He had used these tools for more than thirty years

13. Charley O'Kieffe, *Western Story: The Recollections of Charley O'Kieffe, 1884-1898* (Lincoln: University of Nebraska Press, 1960), 34.

14. "Well Digging Relics," *Nebraska History and Record of Pioneer Days*, II, No. 3 (July-September, 1919), 7.

of well digging, and, measuring perpendicularly, he had dug more than two miles of wells.

In the area around Valentine, Joseph Grewe, a German immigrant, was famous for his prowess as a well digger in the 1880's and 1890's. In seven years during that time, he dug more than six thousand feet of wells ranging from one hundred to two hundred and sixty feet in depth. It was claimed that this short, stout man of prodigious strength dug as much as thirty-five feet in a single day, astounding as it may seem. An honest man of skill and courage, Dutch Joe took great pride in his work and would point to a windmill and say: "There's a Joe Grewe well!" and follow it with: "Straight as a gun barrel!"

Every digger was in constant danger that something might drop into the well on him—a careless move by the tender on the rim above might allow a tool to fall in; a weakened rope might break; a faulty ratchet might release and allow the loaded bucket to fall; mis-judgment of the depth by the assistant might allow the rope to play out too rapidly and strike the digger below; or there might be a faulty attachment between the end of the rope and the bucket, for the man at the top had to carry the bucket some distance away from the mouth of the well to empty it.

It was this last device which was Dutch Joe's nemesis. One day in 1894, he was called back to clear some obstruction from a well he had completed. He loaded a bucket of loose stone at the bottom and gave the signal to hoist it. When it was almost to the top, the bail slipped from the steel catch holding it to the rope, and the loaded bucket dropped to the bottom, killing Joe instantly. He had personally devised the steel catch which saved time by allowing the helper to release the bucket for quick unloading. Many years of use had worn the device, unnoticed by him, and Joe's own invention was the cause of his death.¹⁵

15. Homer Croy, *Corn Country* (New York: Duell, Sloan, & Pearce, 1947), 113-114; "A Hero of the Nebraska Frontier," *Nebraska History and Record of Pioneer Days*, I, No. 1 (February, 1918), 5.



Dutch Joe Grewe, well digger extraordinary.

Newspaper reports seem to indicate that most well tragedies occurred in old wells where some repairs to the well or work on the pump required descent into its depths. In some instances, a well had not been curbed all the way up and a stratum caved in and had to be cleaned out. Board curbing could easily become a source of trouble as the lumber grew older, and pump cylinders had to be repaired from time to time. In 1885 at the little settlement of Cummings Park in Custer County, a well accident occurred involving the curbing of a deep well. James Cummings had a 210-foot well which was used by the whole village. It was about three years old, and he feared that possibly the curbing had become rotten and needed repairs. Resolving to investigate, he hitched a team to a long rope, ran the other end through the pulley and into the well. Onto the end, he fastened a stick about two feet long and took his seat on it astraddle of the rope. His wife slowly backed the team,

lowering him into the well. In his hand he held a short stick with which he tapped the curb to test its soundness as he descended. His wife heard him tapping on the wall until he was about ten feet from the bottom when she heard him cry "Stop!" Then she heard the rapping again.

Suddenly there was a tremendous cry. She screamed at the horses, but they could not raise her husband. A mass of earth had fallen on him. She ran to the top of the well and cried to him, but received no response. She called for help and was fortunate in having neighbors close enough to hear her cries. They rushed over to help. Among others who came was William Garlock, an experienced well man who took charge of rescue operations. Teams were dispatched to West Union for lumber with which to recurb the caved-in portion, dirt was shoveled in to fill the cavity from which the earth had fallen, the curb was cut ready to lower into the well, and Garlock with helpers proceeded to uncover the doomed man, who was under twenty feet of earth. Shortly after he began digging, Garlock reported that he could hear Cummings breathing and the crew of rescuers took courage. After about ten hours of constant work, the man's head was uncovered and to the surprise of all, he was conscious. Cautiously the well digger proceeded until the whole body down below the knees was uncovered. There in semi-darkness two hundred feet below the surface he made an appalling discovery.

The well digger called to those on top to pull him up. When he reached the top, he told them that he could do no more, that the curb had slipped down pinning Cummings' feet under it and that the old curb could not be tampered with without causing the well to cave. The only thing he knew to do was to fasten a rope around Cummings and pull him loose by force. Another man went down and fastened the rope around Cummings, and about twenty-five men grasped the rope above and began pulling, gradually increasing the tension until the rope broke. A three-quarter inch rope was brought, and the well man descended and fastened it around the body. When he reached the top, as many men as could get hold of the rope began pulling. When the body was finally released, every man on the rope fell on

his knees. Cummings was pulled up fast at first in order to get him out of the cave-in depth and then slowly to the mouth of the well. There he was found to be not only alive, but rational and able to tell his experience.

Although he had been in the well thirty hours and was conscious all of the time, he had not realized the length of time he was there. He told them that when they threw dirt into the well preparatory to building a new curb, it seemed to him like a heavy thunderstorm was ensuing. The pump pipe which reached the bottom of the well had prevented the earth from completely sealing him off and allowed a little air to reach him. His face had been next to the pump pipe. The whole country round about, fearing the worst and awaiting word that he had died, was electrified with the news that after his terrifying experience he had been rescued alive. Neighborhood rejoicing was cut short, however, for his body was so badly torn internally that inflammation set in, and he died four days after his rescue.¹⁶

The danger from these deep wells was not confined to well diggers and to those who went down to repair curb or water-raising equipment. After the great exodus of settlers from western Nebraska in the 1890's, vast expanses of the country lay unoccupied. Many homesteaders had either abandoned their claims, allowing them to revert to the government, or had mortgaged them to eastern loan companies which left their Nebraska property unoccupied. This meant hundreds of old, deteriorating wells remained on these abandoned claims—an invitation to disaster to someone who might by chance fall into one. The best known instance of such an accident was that of F. W. Carlin, which is widely known in Nebraska history. While Carlin was on business fifteen miles north of Broken Bow late in the evening, he inadvertently took the wrong road, which led to some old sod buildings. When one of his horses stopped, Carlin got out of the buggy and walked along beside it to see what was the

16. S. D. Butcher, *Pioneer History of Custer County* (Broken Bow, Nebr., 1910), 251-253.

matter. In the twilight, he stepped into one of these old unused wells.

A well man himself, Carlin immediately realized his predicament. Placing his feet together, he uttered a prayer: "Oh God have mercy on my soul!" When he struck the water 143 feet below, he was stunned, a rib broken, and an ankle painfully sprained, but the water was only chest deep. On examination, he found that it was a square well curbed with wood; and by sheer nerve, indomitable will, and ingenuity, he was able to whittle foot holds with a pocket knife and otherwise devise means of scaling the difficult walls. After two days and nights of effort, he reached the top where he grasped some large sunflower stalks, pulled himself out, and lay exhausted on the ground for a time. Then he knelt and thanked God for his deliverance. With a sprained ankle and a broken rib, he could not walk, but crawled painfully toward the only house in the whole country, a mile and a half distant. Famished, he pulled seed pods of wild rose plants along the road and ate the red meat as he inched his way along to the house, where he found help.¹⁷

This incident gained such wide-spread publicity that it awoke people to the danger of leaving old wells open, and the Legislature passed a law requiring the owners of abandoned land on which these wells were located to fill them. As a result, the whole country was busy filling wells. It was a fortunate circumstance for the remaining poverty-stricken settlers who were given contracts by the loan companies to fill the wells. Hauling dirt in wagons to fill these old wells seemed almost as big a job as it had been to dig them. A contract was based upon wages of one and a half to two dollars a day, good wages for a man and his team; and it took days to fill an old well. Eugene Chrisman with typical frontier ingenuity hit upon a scheme to make good money, by filling wells on contract. He made a long double-tree from a pole eight feet long, and hitching a horse at each end and

17. *Custer County Beacon* (Broken Bow), September 5, 1895; E. R. Purcell (ed.), *Pioneer Stories of Custer County, Nebraska* (Broken Bow, Nebr.: Purcells, Inc., 1936), 17-18.

the slip scraper to the center, he was able to straddle a well and scrape the earth directly into the hole. In almost every instance there were ruins of old sod buildings near the well, and he would scrape down the sod walls and pull them into the well. He could sometimes fill a well in this manner in one day. Of course when the agents of the loan company learned about this, his sinecure suddenly ceased.¹⁸

Since digging these deep wells on the table lands was exceedingly expensive, not very many could afford to put down one, and whole neighborhoods got their water from one well. The old water barrel was a family institution. Perhaps two or three kerosene barrels were set in a wagon box, which was driven miles to the well of a more affluent neighbor who could afford a well.¹⁹

There water was drawn, and when the barrels were full, a burlap cloth made from a bran or potato sack was spread over the top; over this a hoop was driven to keep the precious fluid from splashing out. Sometimes an inverted tub was pushed down over the burlap, or even used as a lid without the cloth. Sometimes, too, boards a little shorter than the diameter of the barrel were placed on the surface of the water to keep it from sloshing about so much.

"Don't waste the water!" was the oft repeated paternal admonition. All members of the family bathed (an infrequent ceremony) in the same water and then saved the precious liquid for laundry purposes, after which it was used to scrub the floor if the family was fortunate enough to have a board floor. Cooking and dish water was given to the chickens or hogs as a thirst slaker. In some instances where there was no well on the school grounds, each child carried a bottle of water as an accompaniment to his dinner bucket.

The great depth to water on the table lands had several effects: First, settlers learning of the water problem moved on up the stream valleys to the west, leaving very valuable upland untaken just as the settlers of the seventies had

18. Purcell (ed.), *Pioneer Stories of Custer County, Nebraska*, 57.

19. *Ibid.*, 123, 155, 159, 169.

followed the streams in order to possess the limited supply of trees that were existent.²⁰ Second, easier less expensive ways of finding water were found, and third, those who went to great expense to put down a well charged for the water. Sometimes a settler would put down a trial well the first thing, and if he did not find water at moderate depth, he would pass on westward to find a location within reasonable distance of a stream. Others, accepting conditions as they were, threw a dam across a little dry gulch or ravine or even made a cistern by digging a deep hole in a little ravine and cementing the sides and bottom in order to catch and hold every drop of water from the winter snows and spring rains. This provided a quantity of water closer at hand and eased the chore of water hauling. But this was not ideal for drinking water either, since the inevitable green scum formed on it in the late summer and wiggle tails and tadpoles made it undesirable. Eastern fastidiousness was laid aside, however, and the water was strained through cheese cloth sacks and used.

An easier, cheaper way of putting down wells was sought. Thus the hydraulic or drilled well came into being. This required special equipment known as a drilling rig, which worked by raising and lowering a heavy iron shaft to the lower end of which was screwed a sharpened bit or auger. In earlier times, these rigs were run by horse power. A team moved in a circle to raise the heavy drill to a prescribed height, then allowed it to drop on the same spot repeatedly until it made a hole. Water had to be hauled from the nearest point of supply and poured into this hole to liquify the solids worn loose by the drill. This liquid could then be dipped out with a tubular bucket perhaps ten feet long and allowed to run off some distance from the well. The custom was for the driller to furnish the horses for the power and the man for whom the well was being drilled to haul the water.

There were many unpredictable factors in well drilling, both for the driller and for the one who contracted his

20. Grant L. Shumway (ed.), *History of Western Nebraska and Its People* (Lincoln: Western Publishing & Engraving Co., 1921), I, 514-515.

services. For example, sometimes the drill would hit a void or sort of cavern in the earth which would carry away all of the water which they had poured in from the top. The driller then had to stop the hole up in some manner before he could proceed. The drill was apt to strike anything from a stratum of rock to gravel, hard pan, sand, or different varieties of clay. At first the pioneer driller in a community had to learn what to expect by inquiring from one who had dug a well or from blindly drilling a trial well. One of the great dangers was that of losing an auger in the well. Sometimes the point would work loose and drop into the well or a rope might break. It was with the greatest difficulty that such equipment could be fished out. R. B. Sargent, who bought a drilling rig and learned by experience on his first well, got down about one hundred feet and accidentally dropped the auger with two pieces of shafting. There seemed no way to get it out but to dig, and he went to work at it. Sixty feet down he found thirty feet of sand which he had to curb; lumber for the curbing had to be hauled from the nearest town miles away. Then he struck hardpan and sheet rock. It was nearly a year before the well was completed, and it was a dug well at that.²¹

As the drill went down to make these wells, the crew cased the hole by lowering a pipe just large enough to fit into the drilled hole and pounding it down into place. Oftentimes gravel with a small amount of seepage water was struck which sufficed until a stockman's herd grew larger and he needed a larger supply. Then he would have the driller return and drill on down into the gravel, in which there was an inexhaustible water supply. The prices for drilling varied with the dates and the nature of the underground geological conditions, but was from one dollar to seventy-five cents a foot.

Even with the new system, wells were expensive and tended to be neighborhood affairs, or at least to serve whole neighborhoods. Peter Forney, the first settler on the Cliff Table-land in Custer County to put down a well with an iron casing, got water at 444 feet. The well cost him six hundred

21. Purcell (ed.), *Pioneer Stories of Custer County*, 159-160.

dollars and he had to mortgage his farm to pay for it. It took him years to pay for the well, and when he had it paid for, the principal and interest amounted to \$1,050.²² The excessive costs of deep wells resulted in a practice entirely out of harmony with the universal frontier spirit of hospitality—charging for water. Sometimes stock water was sold for as high as seventy five cents a barrel, but water for domestic use was rarely denied a person who did not have the money.²³ Even some good-sized towns had no water supply and were at the mercy of neighbors for their water needs. Chadron is an example of this. For some time after it was a going, urban community there was no water supply. All of the water for domestic use was hauled to town in wagons from springs at some distance and sold to the consumers at twenty cents a barrel.

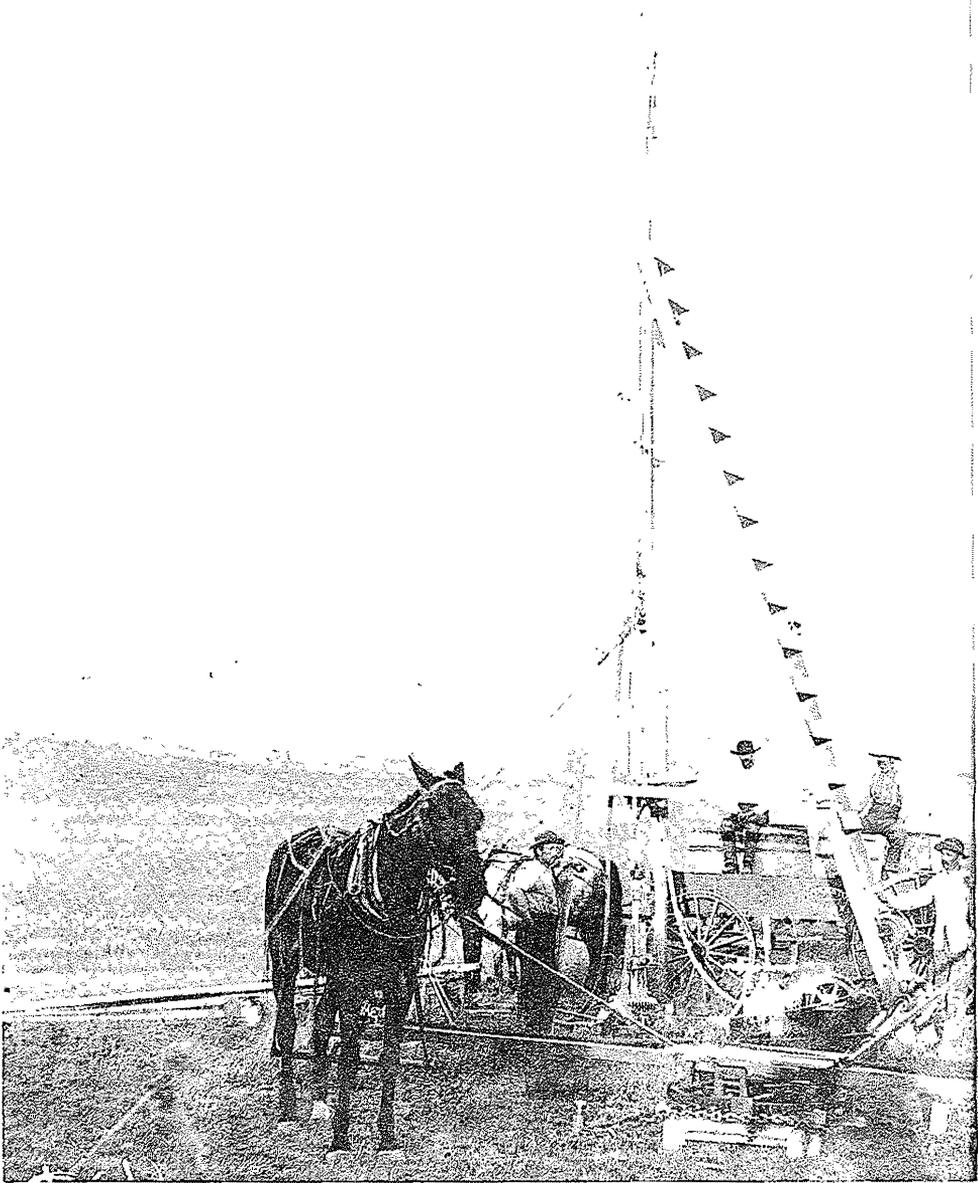
More water was the crying need of the community if it was to grow and develop, and city officials made a contract with a drilling company to drill an artesian well. The price agreed upon for the first thousand feet was two dollars a foot and one dollar a foot for the second thousand. This was not realistic or logical since the second thousand feet would be much more expensive to drill than the first. When the first thousand feet was completed, the drilling company collected for it, then lost their drill beyond recovery and abandoned the whole project. Later, the city voted bonds to make another attempt to secure water and set up a large pumping station three and one half miles from town. Having given up finding water in the town, the residents continued their original system of transporting water from a distance, even though they were now able to use the improved method of a pipeline.²⁴

The frontier farmer naturally did not want to be dependent upon a neighbor for water, both because of the expense and the inconvenience of hauling, and he tried in

22. Butcher, *History of Custer County*, 336.

23. Shumway, *History of Western Nebraska*, 221; A. B. Wood, *Pioneer Tales of the North Platte Valley and Nebraska Panhandle* (Gering, Nebr.: Courier Press, 1938), 223.

24. Shumway, *History of Western Nebraska*, 561-562.



Well drilling rigs such as this horse-power apparatus drilled deep wells in the tablelands. The wagon in the background carried water to liquify loosened dirt.

every way to get a well of his own. Some who lived in an area where water could be gotten by shallower drilling worked for neighbors to lay up a little credit. Some raised sorghum and had it made into sorghum mollasses to trade for the desired

drilled well. But even when the well had been bored, not all of the farmers' problems had been solved. The typical drilled well was a tube lined or cased with iron six inches in diameter. A bucket four inches in diameter and nearly four feet long made of galvanized iron was used to draw the water. This bucket was fitted with a float valve in the bottom nearly the diameter of the bottom. The bucket would hit the water like a shot, the stem regulating the float would open, and the bucket would fill almost immediately. When it was drawn up, the bucket was set on a pin in an unloading sluice box. The pin held open the float valve and allowed the bucket to empty with a gushing effect almost instantaneously. If the well was not too deep and not too many head of stock were to be watered, the bucket could be raised by a windlass, but a horse was sometimes used to raise the water. Even the latter power was inconvenient, and a handier, more effective power was needed.

Fortunately, inventors in the East had been at work to provide the pumps and power needed in Nebraska. There was plenty of wind for power, and the windmill was soon found to be the answer to the need for power to lift water.

The windmill as a piece of equipment was invented and used in Europe long before it migrated to America in colonial days with our European ancestors. As conceived in European countries, the windmill was a power plant patterned after the power used by a sailing ship. It consisted of a solid tower



made of masonry or framework surmounted by a huge wheel consisting of a few spokes but no rim. These spokes were frames covered with sails. An engineer or attendant was on hand to change the amount of sail in conjunction with the amount of power needed at a specific time, and to turn the top part of the tower on a center axis to keep the sail wheel facing the wind. In some cases, the entire mill house turned with the wind. In some of the European mills, small movable slats like old-fashioned window shutters were maneuvered to control the machine, functioning much as the furling and unfurling of sail.²⁵

There was an evident need in America for an inexpensive family power plant to do a specific job automatically and without an attendant; that job was pumping water. In 1854 John Burnham, a pump repair man, suggested to Daniel Halladay, a young mechanic of Ellington, Connecticut, who had an inventive turn, that a self-governing windmill would be a great blessing to mankind since there was wind going to waste which could be harnessed to do the work of pumping water, relieving people of the drudgery of this routine chore. Halladay very quickly invented a windmill which governed itself by centrifugal force. A mechanism was so arranged that when the wheel revolved too fast a weight would slowly rise and reduce the area of sail open to the wind. The Halladay Windmill Company was organized and began to manufacture mills in 1854. Burnham, who was associated with Halladay, went to Chicago and decided that the prairie states region was the best market for windmills, although the mills were made in Connecticut and shipped west. In 1862 the Halladay Windmill Company sold out to the United States Wind Engine and Pump Company, which made its mills at Batavia, Illinois. Halladay remained a prominent figure in that company and increased the efficiency of the windmill by changing the sails of the wheel from the European pattern to the rosette form. Later, the replacement of steel blades for the old slats was a big improvement, not only because they

25. Walter Prescott Webb, *The Great Plains* (Boston: Ginn & Co., 1931), 340.

were more durable, but because steel could be curved, adding power to the performance of the mill.²⁶

The railroads were a major factor in promoting the use of windmills. The small water capacity of the locomotive in the mid-nineteenth century necessitated the establishment of frequent water tanks along the line where the train stopped to "take on water." The first windmills came to Nebraska to serve these lonely water tanks, which stood out in relief by the tracks across the prairies and Great Plains. When it was first built, the Union Pacific Railroad ordered seventy of these large United States Wind Engines. The Burlington and the Chicago & Northwestern, the other two longer mileage railroads in the state, bought the Eclipse windmill from Fairbanks, Morse & Company of Beloit, Wisconsin. Evidence would seem to indicate that the farmers of eastern Nebraska were the next in our state to adopt and use the windmill. By 1877 advertisements were beginning to appear in the *Nebraska Farmer*. There were four mills set up and running at the state fair of 1879: Stover, Marsh, May Bros., and Iron Turbine. In addition to these, several others were represented on the grounds by models. In making his report of the exhibits on the grounds, the editor of the *Nebraska Farmer* said:

. . . right here we wish to say in behalf of windmills, that no man can afford to give the land that is wasted by a stream of water. Either one of the above mentioned mills are worth more than any stream of water. But a few years since, the first question asked by a man buying land, was: "Is there a stream of water on the farm?" But that time is fast passing away, and those that have the stream of water pay very little attention to it, more than to build bridges across it, or wishing it was on some other man's farm.²⁷

The earlier farm windmills in the United States were mounted upon wooden towers. In time these were superseded by galvanized steel towers, which sweep across the prairies and plains. Professor Walter Prescott Webb in his outstanding book, *The Great Plains*, identifies the windmill with the Great Plains and the ranchers. My research on

26. *Ibid.*, 338-339.

27. *Nebraska Farmer*, III, No. 10 (October, 1879), 238.

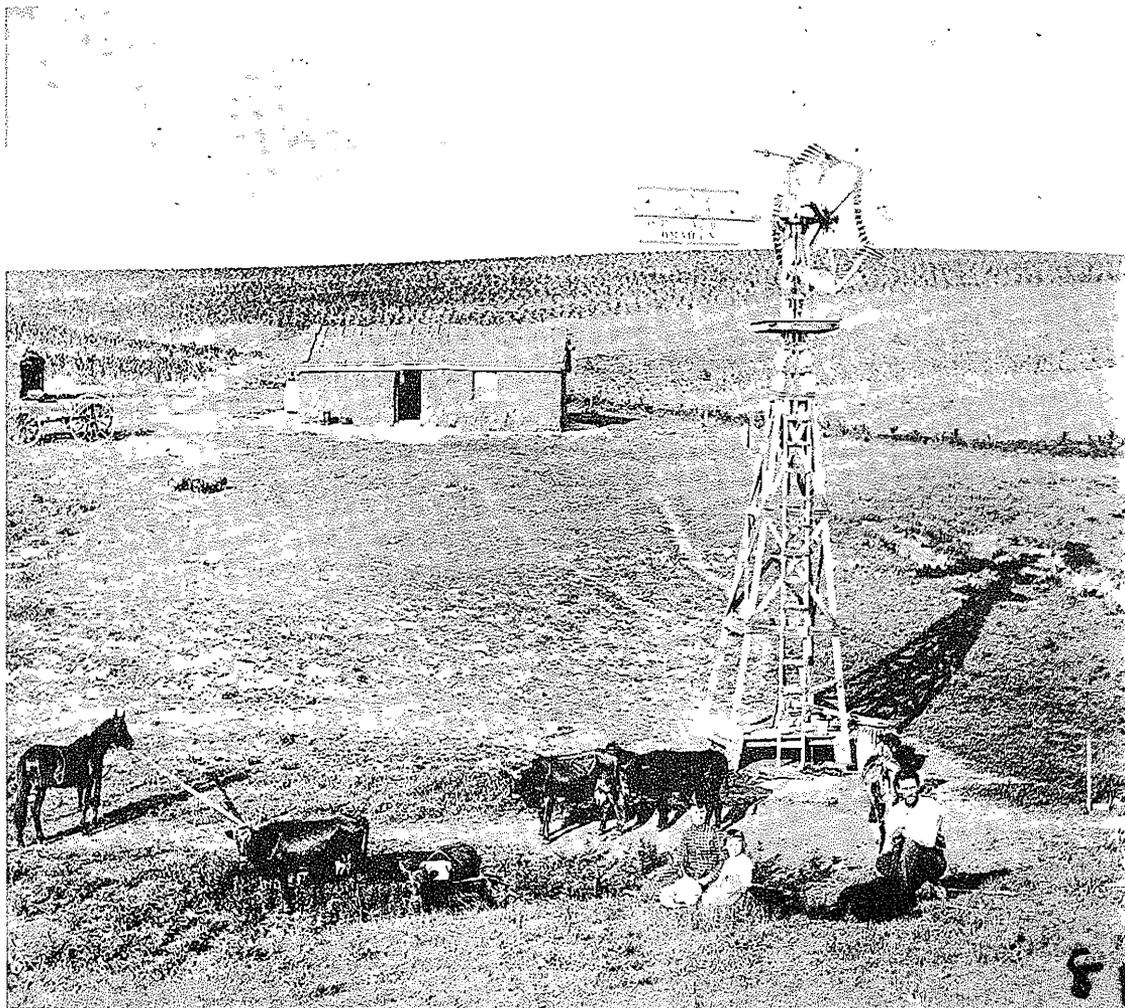
Nebraska history indicates that the prairie farmer first popularized the windmill, then it moved into the range country. Professor Webb quoted H. N. Wade, president of the United States Wind Engine and Pump Company, as saying that his company "made little or no effort for the sale of windmills for watering cattle west of the state of Illinois until some time in the Seventies." And Fairbanks, Morse & Company placed "the date of manufacture of windmills on a large scale in the United States at 1873."²⁸ The range and ranch cattle industry was hardly developed to the point where it was using windmills at this time. On the other hand, advertisements for windmills appear in the eastern Nebraska newspapers as early as 1877, and news items inform us that farmers were buying them in 1881 and 1882. An ad in the *Fremont Herald* on November 16, 1882, informed the readers that a carload of Eclipse windmills had arrived in that eastern Nebraska town and invited farmers to come and buy.

In the absence of any definite data as to the relative number of windmills in eastern Nebraska in contrast with the range country, it can be conjectured that the windmill pushed out on the Great Plains ranching area in the early eighties, contemporaneous with their advent on farms in the eastern part of the state. In the early ranching period, the cattlemen controlled the range by law of prior use, which had been established by the first comers through their control of water. Since a cow would not walk over fifteen miles for water in a day, the man who controlled a spring or never-failing water hole monopolized the grass for seven and a half miles around it. In the 1860's and 1870's, farseeing cattlemen busied themselves securing all of the streams and isolated springs for cattle range. Once again the valleys were first occupied for water, just as they had been in the eastern part of the state by farmers seeking trees and water.

The coming of the windmill at a time when these natural water sources were for the most part reserved by cattlemen enabled the ranchers to put down wells and make available to themselves the vast areas which were not adjacent to a

28. Webb, *The Great Plains*, 339.

natural water supply. The windmill was particularly well suited to the use of the rancher who was expanding his range or to newcomers ranchmen in the early 1880's. A well could be drilled and equipped with a windmill and tank to make available a fifteen mile area just as surely as the discovery of a never-failing spring could. Since a windmill pumped slowly



The Halladay Standard Windmill soon became a common sight on the Nebraska plains.

and in Nebraska there is scarcely ever any lack of wind, the mill pumped the water into the tank about as fast as it ran into the well, keeping the tank full or overflowing. Of course it was necessary to have a circuit-riding cowboy make the rounds occasionally to see that the pumps were in order, but his job was largely that of a sentry who gave the warning when once in a long time a well needed attention. A gasoline engine or even an electric motor—had electricity been available—would not have been nearly as suitable for the purpose of the rancher. If the rider had attempted to pump a tank full of water by machine and then turn off the power when he left, his would have been an endless task. With an engine, the drilled well would have pumped dry in a few minutes and he would have had to stop the engine and wait for the well to refill a number of times before the tank was full. With the windmill, the tank was kept full without any particular effort. It did not matter if the tank overflowed since there was a plentiful supply ordinarily, but if it did, plumbing could be arranged to allow the overflow to run back into the well.

The devastating drought of the nineties, which caused the depopulation of vast areas of the state west of the one hundredth meridian and brought distress even to many parts of the state farther east, turned the thoughts of Nebraskans toward irrigation. Agricultural editors and other farm leaders became irrigation propagandists. One recommended plan for the farmer to become self-sufficing and to tide him over when no rain fell was for him to dig an irrigation pond of an acre or two, dig a well, and pump water into the pond all winter long. Thus enough water could be saved up during the winter months to irrigate the five to ten acres needed to provide his foodstuff.

To meet the need for power to draw water from the shallow wells along the Platte, people began to rig up homemade windmills. In 1897 Professor E. H. Barbour, the state geologist, sent out students from the University of Nebraska to follow the Platte River and report on these homemade mills. The following year, he himself went. The results were published in pamphlet form as an encouragement for others to construct homemade windmills similar to the

numerous ones in the Platte Valley. Professor Barbour stated that "Nebraska seems to be the heart and center of the windmill movement."²⁹

In dollars and cents these mills cost almost nothing, although they required some labor. Some of them, made of old poles and boards around the place and put together at odd times, cost only a dollar and a half. The jumbo mill or "go-devil" was made like an old-fashioned overshot water wheel. The wheel, fastened to a horizontal axle, was mounted on the top edge of a huge box. Spokes ran out from the axle supporting five or six horizontal sails made of old gunny sacks, boards, or other makeshift materials. Since the lower half of the wheel was protected by the box at all times, the power of the wind was caught on the top half of the wheel, forcing it to revolve. A vertical lift door could be raised to cut off the wind and thus slow down the wheel or stop it entirely. The journals, cog wheels, bearings, and other iron pieces were taken from discarded farm machinery.³⁰

But the day of the windmill, both homemade and factory produced, is over. To be sure there is need for water as there was in the day of the pioneers, but the Platte Valley with its abundant underflow is equal to modern demands. Big motor-driven turbine pumps pour out hundreds of gallons per minute, whereas the homesteader drew it overhand with an oaken bucket.

29. Erwin Hinckley Barbour, "Wells and Windmills in Nebraska, Water Supply and Irrigation Papers," *U. S. Geological Survey* (Washington, D. C., 1899), No. 29, pp. 35-40; *Scientific American*, XXIV, No. 2 (January 13, 1900), 24; Walter Prescott Webb, "Some Prairie Inventions," *Nebraska History*, XXXIV, No. 4, (December, 1953), 241.

30. Greville Bathe, *Horizontal Windmills* (Philadelphia: Allen, Lane & Scott, 1948), 22; Barbour, "Wells and Windmills in Nebraska," 35-44.